THE WATER TABLE ON LONG ISLAND, NEW YORK, IN MARCH 1974

By

Edward J. Koszalka

U. S. Department of the Interior
Geological Survey

LONG ISLAND WATER RESOURCES
BULLETIN LIWR-5

Prepared by the U.S. Geological Survey in cooperation with the New York State Department of Environmental Conservation, the Nassau County Department of Public Works, the Suffolk County Department of Environmental Control, and the Suffolk County Water Authority.

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(Plates are in pocket)

FACTORS FOR CONVERTING ENGLISH UNITS
OF MEASURE TO INTERNATIONAL SYSTEM (SI) UNITS

Multiply English units	by	To obtain SI units
inches	25.4	millimetres
feet	.3048	metres
miles	1.609	kilometres
million gallons per day	3,785	cubic metres per day

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ABSTRACT

Water-level measurements in 364 observation wells in Long Island in March 1974 show that the altitude of the water table ranged from more than 10 feet (3.0 metres) below sea level in eastern Queens County to nearly 120 feet (36.6 metres) above mean sea level in northwestern Nassau County. The water table rose considerably during the period 1970-74 throughout most of Long Island in response to the above-normal precipitation during 1972 and 1973. In Kings County, the net rise in water levels was generally less than 4 feet (1.2 metres). In western Queens County, a maximum rise of about 8 feet (2.4 metres) was recorded, but in eastern Queens County water levels declined about 4 feet (1.2 metres). Net water-level rises generally ranged from 2 to 11 feet (0.6 to 3.4 metres) in northern Nassau County and were less than 4 feet (1.2 metres) in the southeastern part of the county. In southwestern Nassau County, however, water levels declined locally by nearly 4 feet (1.2 metres). In western and central Suffolk County, a maximum net rise of about 8 feet (2.4 metres) was recorded. In eastern and southern Suffolk County, net rise was less than 4 feet (1.2 metres).

INTRODUCTION

The ground-water reservoir is the sole source of public-water supply in most of Long Island. The New York State Department of Environmental Conservation reported that a total of about 480 million gallons per day was withdrawn from the ground-water reservoir through public-water-supply wells alone in 1972; additional amounts were withdrawn for industrial and agricultural purposes. Because of the importance of ground water on Long Island, the U.S. Geological Survey, in cooperation with and in addition to State and local agencies, has monitored the position of the water table by periodic measurements of water levels in wells since 1905.

Water-level measurements in March 1970 for 344 wells throughout Long Island were reported by Kimmel (1972). Water levels of 302 of the same wells and an additional 62 wells were measured in March 1974. Configuration of the water table in March 1974 is shown by contour maps (pls. 1 and 2). Changes in water levels since March 1970 are shown in a net-change map (pl. 3) and in hydrographs of selected wells (fig. 1).

GEOHYDROLOGY

The geology and the hydrology of Long Island have been discussed in numerous reports. Among the more comprehensive reports are those by Veatch, Slichter, Bowman, Crosby, and Horton (1906), Fuller (1914), Suter, de Laguna, and Perlmutter (1949), Cohen, Franke, and Foxworthy (1968), and Jensen and Soren (1974). The ground-water reservoir on Long Island consists of a wedge-shaped sequence of unconsolidated deposits lying on bedrock of Precambrain to lower Paleozoic age. The unconsolidated deposits range in thickness from a featheredge in northwest Queens County to about 2,000 feet in southern Suffolk County. They are composed of a wedge of sediments of Upper Cretaceous age that are overlain by a thin layer of Pleistocene outwash and morainal deposits. On the average, about 50 percent of the precipitation on the island infiltrates the ground through the generally highly permeable surficial Pleistocene deposits and percolates downward to the water table, the top of the zone of saturation. In some places on Long Island, small bodies of perched ground water overlie the principal water table, but these bodies are not discussed in this report.

PREVIOUS WATER-TABLE MAPS

Burr, Hering, and Freeman (1904) published the first water-table map of most of Long Island. Other water-table maps were published by: Spear (1912), for 1908; Suter (1937), for 1936; Jacob (1945), for 1943; Lusczynski and Johnson (1951), for 1951; Kimmel (1972) for 1970; and Koszalka and Koch (1974), and Jensen and Soren (1974), for 1971. Water-table maps for all or parts of the individual counties in Long Island are in reports in the comprehensive bibliography of Cohen and others (1968). Updated unpublished supplements of the bibliography are available from the Mineola office of the Geological Survey. Unpublished maps of the water table in most of Long Island for the years 1950, 1965, and 1967, prepared by the New York State Water Resources Commission, may be inspected at the office of New York State Department of Environmental Conservation in Stony Brook, N.Y.

WATER-TABLE MAP FOR 1974

Water-level measurements in 364 wells in March 1974 were used to prepare the water-table maps in plates 1 and 2. Most of the water levels in Nassau County were measured by the Nassau County Department of Public Works; the remainder were measured by the Geological Survey. Measurements were made by the wetted-tape method to the nearest hundredth of a foot. Over most of the island, the contours in plates 1 and 2 are probably accurate to within half a contour interval. In places where the control is poor and the geohydrology is uncertain, as in the north-shore area of Suffolk County, the contours are less accurate.

The water table in Nassau and Suffolk Counties is characterized by a band of high water levels that extends in an east-west direction somewhat north of the centerline of the island. This band contains a mound in central Suffolk County and one in Nassau County, whose maximum altitudes are about 65 and 90 feet, respectively. On the two eastern peninsulas of the island are two major ground-water mounds whose maximum altitudes are 5 feet (north peninsula) and 20 feet (south peninsula). In central Queens County, a cone of depression extends to more than 10 feet below sea level.

The highest point on the water table, about 120 feet in altitude, is at Manhasset Neck in northwestern Nassau County. This feature was mapped by Swarzenski (1963, pl. 9), who reported (p. 33) that it resulted from a combination of topography and zones of low hydraulic conductivity.

WATER-TABLE CHANGES

As shown in plate 3, the water table in 1974 differs significantly from the water table in 1970 throughout the central part of Long Island. The change is related to the amount of precipitation during 1972 and 1973. In 1972, precipitation at the Setauket precipitation station, which has the longest records on Long Island, totaled 53.36 inches, or 8.86 inches above the 83-year average of 44.50 inches for this station. In 1973, precipitation at the same station totaled 50.80 inches, or 6.30 inches above the long-term average.

In Kings County, the net rise in water levels was generally less than 4 feet from 1970 to 1974. In western Queens County, the water levels rose as much as 8 feet, but in eastern Queens County the water levels declined about 4 feet. This decline extended eastward into the southwestern part of Nassau County. Water levels rose throughout the northern, central, and eastern parts of Nassau County; the rise exceeded 8 feet over several square miles in Oyster Bay. A net rise of 4 feet or more continued into the western part of Suffolk County where it was interrupted by the Nissequogue River. This rise continued east of the river where a maximum rise of about 6 feet was measured. The rise in the water table in the remaining parts of Suffolk County was less than 4 feet.

Hydrographs of water levels from selected wells are shown in figure 1. They indicate water-level trends in various parts of Long Island from March 1970 to March 1974. The steep rises in the hydrographs of wells K1236, Q1391, and Q1254 are related to a decrease in ground-water pumpage in Kings County and western Queens County as well as to the above-normal precipitation in 1972 and 1973.

With the gradual cessation of public-supply pumping in western Queens County, water levels have risen since 1970. Hydrographs of wells Q1391 and Q1254 show water-level rises of about 6 feet and 9 feet, respectively. These rises reflect a shift of the center of the depression in the water table to the east. The shift to the east is also reflected in the hydrograph of well Q1249 approximately 5 miles east of well Q1254. The water level in well Q1249 has declined about 4 feet since 1970 and was below sea level in March 1974.

The area of decline in water levels extends into southwestern Nassau County. The hydrograph for well N1109 shows a net decline in water level of about 3 feet. This decline as well as the decline in eastern Queens County can be attributed to the increase of ground-water development locally and to the sanitary sewering in western Nassau County (Franke and McClymonds, 1972), both of which negated any rise that should have resulted from recharge of the ground-water reservoir by precipitation. In northern Nassau County, where sewering is not widespread, water levels increased between March 1970 and March 1974. Hydrographs for wells N1104, N8309, and N1211 show net increases of about 2 feet, 7 feet, and 11 feet, respectively. These rises in water levels resulted from the above-normal precipitation of 1972 and 1973.

The rise in water levels experienced in northern Nassau County extended eastward into western and central Suffolk County (pl. 3). Hydrographs for wells S1805 and S3513 show net increases of about 2 feet and 6 feet respectively. As in northern Nassau County, the rise in water levels is attributed primarily to the above-normal precipitation. The only areas in western and central Suffolk County that experienced a smaller rise in the water table were eastern Huntington and western Smithtown towns. This is shown on the net-change map (pl. 3) and is illustrated by the hydrograph of well S3514 (fig. 1). The decline in water levels in these two towns is probably related to the unique geohydrologic conditions there as discussed by Lubke (1964). In southern Suffolk County, the maximum rise in water levels was less than 4 feet. This smaller rise than that in the north is attributed to the fact that under natural conditions water levels tend to fluctuate less in areas away from the ground-water divide than in areas near the divide. In eastern Suffolk County the net rise of the water table was estimated to be less than 4 feet. Estimation was necessary in this area because of a scarcity of 1970 water-level data with which to compare 1974 water-level data.

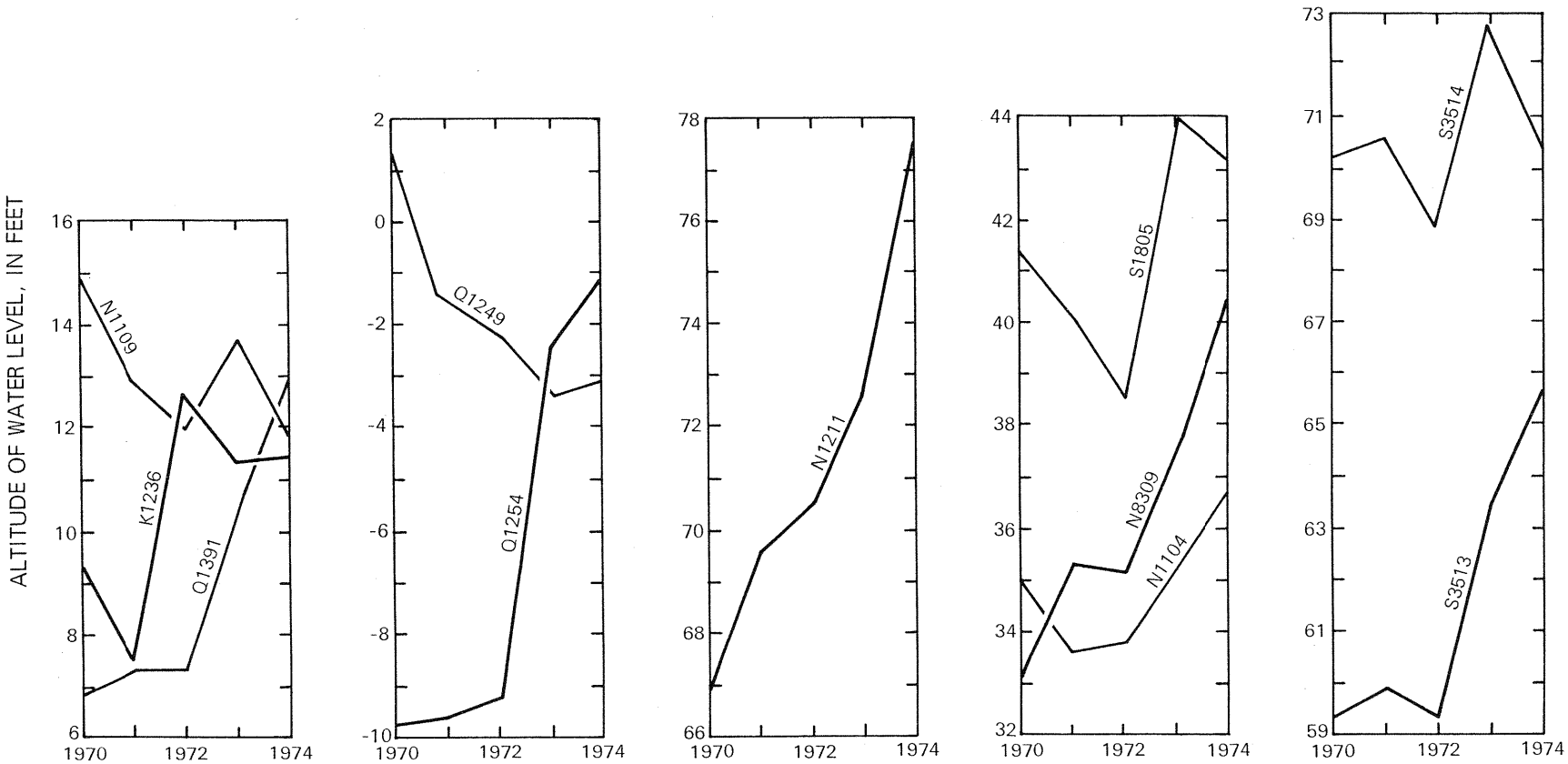

Figure 1.--Hydrographs of selected wells from March 1970 to March 1974.

SUMMARY AND CONCLUSIONS

From March 1970 to March 1974, the net changes in ground-water levels in wells in Long Island were as follows: (1) generally less than a 4-foot rise in Kings County; (2) a rise of as much as 8 feet in western Queens County, but a decline of about 4 feet in eastern Queens County; (3) a rise of as much as 11 feet throughout northern Nassau County, but a slight decline in southwestern Nassau County because of extensive ground-water development and sanitary sewering; (4) a rise of as much as 6 feet in western and central Suffolk County, and (5) rises of less than 4 feet in eastern and southern Suffolk County.

Minimal recharge to the ground-water reservoir by precipitation in Kings County may explain the comparatively slight rise in water levels in that county. The rise in water levels in western Queens County reflects both greater recharge by precipitation and a decrease in public-supply pumpage in that area.

The water-level decline in eastern Queens County and southwestern Nassau County, despite unusually high precipitation during 1972-73, resulted from extensive local ground-water development and sewering.

The rise in water levels in northern Nassau County and in all of Suffolk County can be attributed almost totally to the greater than average amounts of precipitation during 1972-73.

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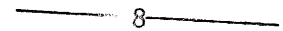
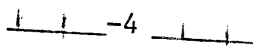
ERRATA

Plate 3, Explanation.

Description should read:



Line of equal net rise in the water table. Interval 4 feet; datum is mean sea level.



Line of equal net decline in the water table. Interval 4 feet; datum is mean sea level.